

Triggers and Scalers

- 1 What are the scalers?
 - The scalers are banks of counters with VME readout. These hardware scalers do the TSI accounting.
 - Level 1 trigger rates (GFRED gated)
 - Livetime/Deadtime accounting
 - Buffer occupancy, etc.
 - There are also ‘software’ scalers from L2 and L3.
 - Level 1 trigger rates (GLIVE gated)
 - Level 2 trigger rates
 - Level 3 trigger rates

2 What is Deadtime?

- Deadtime occurs when the Trigger Supervisor must send a Level 1 Reject regardless of what the trigger tells it to do
- Deadtime ($> 5\%$) is bad!

3 Deadtime/Livetime accounting

- Input signals to Deadtime/Livetime accounting include
 - CDF_CLK - the basic unit of time
 - CDF_BC - gate indicating a filled crossing
 - CDF_ABORT - gate marking crossings in the abort gap
 - BUSY - from the VRBs via the TRACER
 - INHIBIT - Trigger inhibit
 - TS_RUN - as in Halt/Recover/Run
 - TS_PAUSE - from PAUSE button on run-Control panel
 - L2BF_EMPTY - Internal TS signal marker indicating at least one free L2 buffer

- Definition of Deadtime/Livetime Signals
 - Runtime Gate: $GRUN = TS_RUN * \overline{TS_PAUSE} * CDF_BC * \overline{CDF_ABORT}$
 - Livetime Gate: $GLIVE = GRUN * L2BF_EMPTY * \overline{INHIBIT}$
- and ...
 - Fredtime Gate: $GFRED = GRUN * \overline{INHIBIT}$
- Accounting signals
 - $RUN_TIME = GRUN * CDF_CLK$:
Counts each filled beam crossing the DAQ is enabled to run
 - $LIVE_TIME = GLIVE * CDF_CLK$:
Counts each filled beam crossing the DAQ is enabled to run and is not forced to send Level 1 Rejects

4 Sources of Deadtime

- INHIBIT_DEAD: Usually an HV trip.
- No Free Level 2 Buffers
 - BUSY_DEAD: A VRB is filling up. Check EVB status
 - L1DONE_DEAD: Waiting for L1_DONE from SRC. Check Silicon status.
 - L2_DEAD: All 4 buffers full. Waiting for L2 decision from alpha. Page Level 2 expert.
 - READOUT_DEAD: 4 L2 Accepts issued. Front-end crate(s) slow to be DONE. Find slow crate with RXPT monitor. Usually bad FE card or bad FE code.
 - L2_READOUT_DEAD: One buffer being read out, other 3 waiting L2 decision. This is rare..
 - TSI_DEADTIME. Time lost due to TS book-keeping. Very rare. Contact expert.
- Level 2 Buffers will fill up if the L1 Accept rate

is too high.

- Trigger Rates and Deadtimes can be monitored
 - DAQMon “Rates and Deadtimes” panel
 - XMon, a consumer process
 - The Run Summary web page